REMARKS/ARGUMENTS

Reconsideration and withdrawal of the Examiner's rejection of the above-identified application is respectfully requested in view of the foregoing amendments and following remarks. Claims 1 and 14 have been amended. Claims 3 and 4 have been canceled. Claims 17 and 18 have been added. Claims 17 and 18 correspond to original claims 3 and 4, now written in independent form and containing all of the elements of amended claim 1. No new matter has been added.

The Examiner rejected claims 1 and 14 under 35 U.S.C. 112, stating that the phrase "except for said traveling magnetic field no further magnetic field being applied to the melt" was not supported by the specification. This phrase has been canceled from the claims and the claims have been amended to recite that the magnetic field consists of a traveling magnetic field. The description only refers to a traveling magnetic field, and it is this field that is essential to the invention. No other types of magnetic field are mentioned in the specification. The absence of other possible types of magnetic fields in the specification indicates that the Applicant considers a traveling magnetic field to be the essential element in order to enable the invention.

The Examiner rejected claims 1-3 and 14-16 under 35 U.S.C. 103 as being unpatentable over *Tamatsuka* in view of *Luter et al* and *Aratani*. Claim 4 was rejected over *Tamatsuka et al.* in view of *Luter et al.* and *Aratani* and further in view of *Szekely et al.* Claims 14 and 16 were rejected as being unpatentable over *Tamatsuka et al.* in view of *Luter et al.* and *Aratani*, and further in view of *Lari et al*, or *Morishita et al.* Applicant respectfully traverses.

The present invention provides a method for producing silicon single crystals with an improved yield. The inventors found that low-frequency temperature fluctuations are responsible for yield reduction due to the formation of dislocations. According to the invention, the melt is subjected to a traveling magnetic field in order to attenuate the low frequency temperature fluctuations. The attenuation of the low frequency temperature fluctuations is correlated to the intensity of the traveling magnetic field (cf. Fig. 2). Hence the benefit of the invention is obtained if the intensity of the traveling magnetic field is sufficient to attenuate such low frequency temperature fluctuations. On the other hand, the convection in the melt is increased if the intensity of the traveling magnetic field is increased.

The Examiner stated that *Tamatsuka* and *Aratani* are silent as to exposing the silicon melt to an influence of a traveling magnetic field, which exerts a substantially vertically oriented force on the melt in a region of the crucible wall, and that this teaching is shown by *Aratani*. Applicant respectfully traverses.

Aratani teaches that the incorporation of oxygen in the single crystal can be reduced if the melt is subjected to traveling magnetic field. In order to achieve such a reduction, "the traveling magnetic field is applied to further suppress an unwanted thermal convection flow 10 without decreasing the forced convection flow 11 (cf. col. 4, lines 32.-35). As a result, *Aratani* teaches the opposite of the present invention, i.e., to apply the traveling magnetic field in order to reduce the convection in the region of the crucible wall, whereas the present invention teaches to apply the traveling magnetic field with sufficient intensity in order to produce enhanced convection which removes low-frequency temperature fluctuations. Thus, it would not have been obvious to reverse the teaching of Artani and to increase the convection in the region of the crucible wall in stead of decreasing it as intended by *Aratani*. Accordingly, combining the teachings of *Aratani* with those of *Tamatsuka* and *Luter* would not lead to the claimed invention.

Szekely et al. teaches a method which uses a combination of magnetic fields in order to control the melt flow. According to this document, a traveling magnetic field is used for stirring the melt in order to control the flow pattern in the bulk melt and at the melt-crucible interface (cf. col. 2, lines 25-28 and lines 36-37) and an axial magnetic field (cusp field) is applied in the vicinity of the melt-crystal interface in order to ensure a laminar flow and quiescent conditions in this region of the melt (cf. col. 2, lines 19-21).

However, quiescent conditions are inapt for suppressing the low frequency temperature fluctuations, Consequently, to establish quiescent conditions in the vicinity of the melt is quite contrary to the measure proposed by the claimed invention, i.e., an enhancement of the convection. Thus, *Szekely et al.* teaches away from the claimed invention.

Moreover, the Examiner refers to col. 3, lines 10-62, and argues that *Szekely et al.* also teaches the magnetic field with an axial upward or downward direction . . .". However, this teaching is not related to the traveling magnetic field, but to a static magnetic field, which is not part of the invention. In addition, the claims refer to the direction of force applied by

the action of the traveling magnetic field, and not to the direction of the field itself. Thus, combining *Szekely* with the other references would not lead to the claimed invention. None of the references, either alone or in combination, teach or suggest applying a traveling magnetic field that exerts a substantially vertically oriented force on the melt in a region of the crucible wall, with an intensity which is sufficient to attenuate low-frequency temperature fluctuations in the melt.

Accordingly, Applicant submits that claims 1, 2, 14, 17 and 18 are patentable over the cited references, taken either singly or in combination. Early allowance of the claims is respectfully requested.

Respectfully submitted,
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